



Sadiq Public School

Do the right, fear no man

Subject: Biology

Class: I1

Day: Saturday, 16th November 2024

Lesson

This lesson focuses on gymnosperms and life cycle of pinus.

A: Inquiry

Do pine trees produce flowers?



Of course not. But look closely at these pine cones. Notice the shape. Can you see the "petals?" They do seem oddly similar to flowers. These pine cones have a prominent role in the gymnosperm life cycle. So what is the function of a pine cone?

B: Information

What are Gymnosperms?

Gymnosperm means naked seed. These plants do not have flowers. And so, the seeds are not enclosed inside any specialized structure like the ovary seen in the other group of plants i.e. angiosperms. Rather, the seeds develop on the surface of the reproductive structures of the plants. Thus are visible as cones on maturity. Sometimes we can find the seeds on small stalks too.



The plant body shows differentiation and is divided into leaves, stem, and roots. The leaves are *needle-like* with a thick cuticle and sunken stomata, as seen in conifers. This feature helps in the reduction of water loss due to transpiration.

The root system present in the gymnosperms is the *taproot system*. In some plants, these roots have an association with fungi and form mycorrhiza, e.g. Pinus.

Reproduction and Fertilization in Gymnosperms

Strobilus or cone is the reproductive structure of gymnosperms. Both male and female strobili can be present on the same (seen in Pinus) or on different trees (seen in Cycas). Gymnosperm plants are heterosporous. They produce different spores, which are the haploid microspores and megaspores.

- **Male Cones** – the male strobili or male cones have microsporophylls, which have the microsporangia that produce the haploid microspores. Some of these microspores develop into male gametes called the pollen grains, while the rest degenerate.

- **Female Cones** – the megasporophylls form a cluster and are called as the female strobili or cones. They bear the ovules having the megasporangium. Thus produces the haploid megaspores and a megaspore mother cell.

The megaspore mother cell undergoes meiotic division produces four megaspores. One of these megaspores develops into the multicellular female gametophyte. The female gametophyte also has two or more archegonia, which are the female sex organs.

Fertilization – When the pollen grains are released from the microsporangium, they get dispersed through wind and reach the female cones. The pollen grain develops a pollen tube, which grows towards the archegonium.

The discharge of male gametes happens near the mouth of the archegonium. The fusion of the male and female gametes occurs. After fertilization, a zygote develops to form the embryo and the ovule forms the seed. The following figure shows the life cycle of a gymnosperm.

Classification of Gymnosperms

The four divisions of Gymnosperms include

- Pinophyta
- Cycadophyta
- Ginkgophyta
- Gnetophyta

Life Cycle of Gymnosperms

Gymnosperms are vascular plants that produce seeds in cones. Examples include conifers such as pine and spruce trees. The gymnosperm life cycle has a dominant sporophyte generation. Both gametophytes and the next generation's new sporophytes develop on the sporophyte parent plant. Figure below is a diagram of a gymnosperm life cycle.

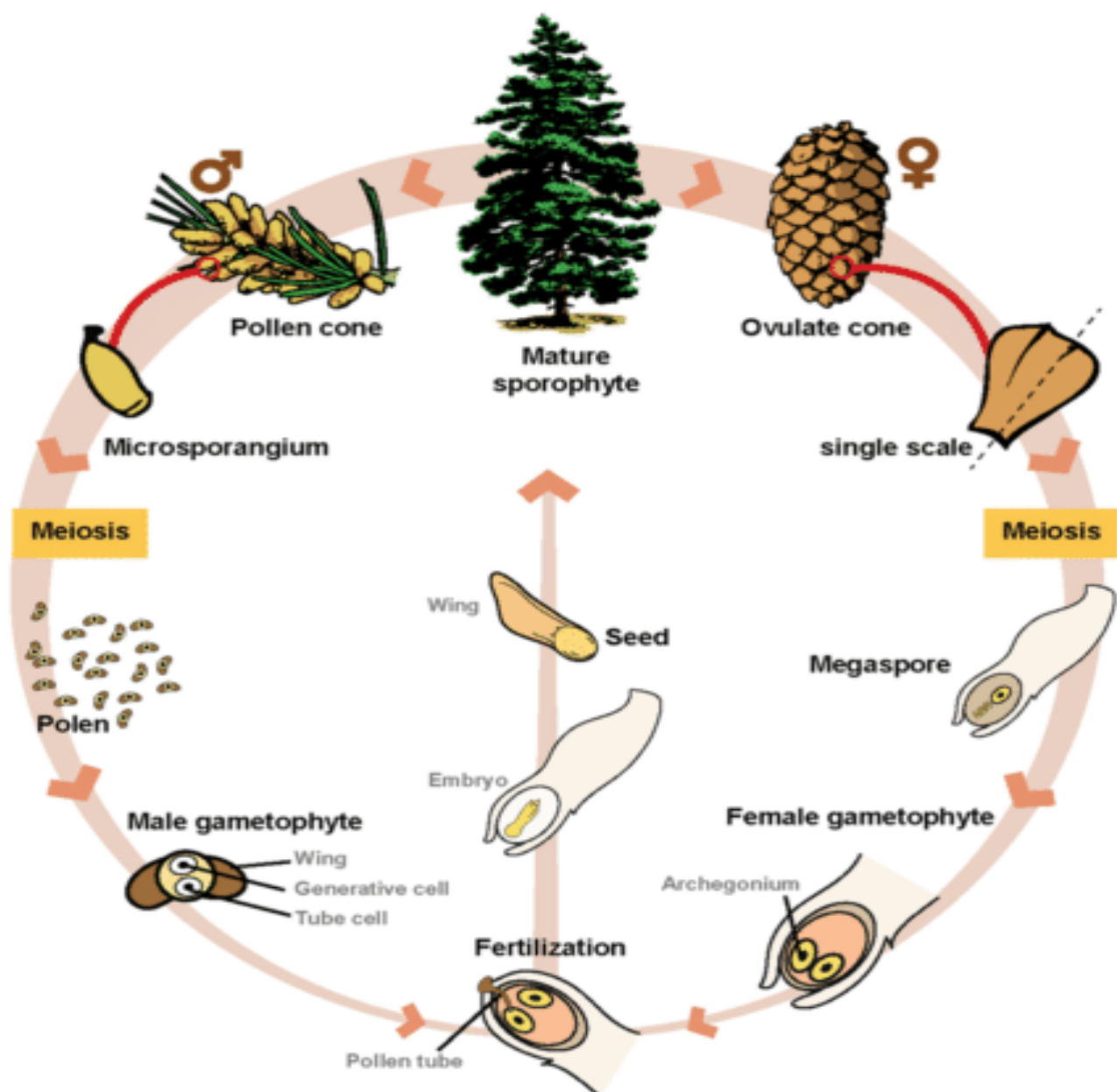


Fig: life cycle of pinus

The gymnosperm life cycle follows the general plant life cycle, but with some new adaptations. Can you identify them?

Cones form on a mature sporophyte plant. Inside male cones, male spores develop into male gametophytes. Each male gametophyte consists of several cells enclosed within a grain of **pollen**. Inside female cones, female spores develop into female gametophytes. Each female gametophyte produces an egg inside an ovule.

Pollination occurs when pollen is transferred from a male to female cone. If sperm then travel from the pollen to an egg so fertilization can occur, a diploid zygote results. The zygote develops into an embryo within a seed, which forms from the ovule inside the female cone. If the seed germinates, it may grow into a mature sporophyte tree, which repeats the cycle.

C: Synthesis/absorbing the information

Multiple choice questions:

- 1. Which structure in the life cycle of Pinus produces male gametes?**
 - a) Ovule
 - b) Archegonium
 - c) Pollen grain
 - d) Megasporangium
- 2. What type of life cycle is observed in Pinus?**
 - a) Haplontic
 - b) Diplontic
 - c) Haplodiplontic
 - d) None of these
- 3. In Pinus, the male cone produces spores called:**
 - a) Megaspores
 - b) Microspores
 - c) Zoospores
 - d) Akinetes
- 4. The female gametophyte in Pinus is developed from the:**
 - a) Microspore
 - b) Megaspore
 - c) Zygote
 - d) Archegonium
- 5. The dominant phase in the life cycle of Pinus is:**
 - a) Gametophyte
 - b) Sporophyte
 - c) Prothallus
 - d) None

D: Practising activity: (on notebooks)

Create your own cycle diagram to represent the life cycle of a gymnosperm.